

“The Voice of the Training Range”

Volume 2



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Dismount Video Player Unit for DMPRC

**By John Moulton
EOIR Technologies**

EOIR Technologies is developing the Dismount Soldier Video Player Unit for the Digital Multipurpose Range Complex at Fort Hood, Texas. The Dismount Video Player Unit (DMT-VPU) will be capable of transmitting real-time video of the squad leader's battlefield view during Bradley Dismount Exercises. The DMT-VPU will be integral to the Vehicle borne A/V Player Unit also being developed by EOIR to send vehicle audio and through sight video back to the Range Operations Center (ROC) in real time. During dismounted exercises, the DMT-VPU will send the squad leaders view back to the Bradley, which in turn will send the video back to the ROC, along with crew audio and video.

The DMT-VPU will consist of a miniature helmet mounted camera and transmitter assembly as well as a small rechargeable battery pack to be contained in the soldiers Land Warrior vest. The helmet mounted camera and transmitter assembly will weigh under 8 ounces and not hinder the performance of the soldier. The transmitter will be capable of providing high quality video in both day light and low light evening conditions and will have a reliable transmit range of 1000 yards line of sight.

Instrumented Ranges

By Jorge Rivera

Product Director, Instrumented Ranges

In previous editions, we focused on a program known as Digital Ranges. The program name has now been changed to Instrumented Ranges. The reason for the name change is to recognize the reality that the major changes from previous ranges is not solely in digitizing the ranges, but in more completely instrumenting the ranges.

Along with this re-focusing, we're trying to present a broad cross-section of the types of technology that will be incorporated into these new ranges. We hope that you find the articles in this edition both informative and interesting.

Anyone that wishes to offer comment should address their comments to Jorge Rivera, the Project Director for Instrumented Ranges. He may be contacted via e-mail at Jorge_Rivera@peostri.army.mil. Alternatively, comments may be addressed to Bob Lowell, the Editor of the Newsletter. That e-mail address is Robert_Lowell-Contractor@peostri.army.mil.

Homestation Instrumented Training System (HITS)

Provided by Jim Gregory

DCSOPS&T

In this article we thought it would be useful to the readership to provide background, facts, and status of the Homestation Instrumented Training System (HITS) training requirements.

The Homestation Instrumented Training System (HITS) is a Common Training Instrumentation Architecture (CTIA) compliant instrumentation system that provides a common set of exercise planning, preparation, control, assessment, and evaluation tools for live training. HITS provides linkages between warfighting systems, live simulations, constructive simulations, tactical internet communications, battle simulation, and virtual and constructive simulator capabilities available at a homestation installation.

HITS complies with both the Synthetic Training Environment (STE) Capstone Requirements Document (CRD) and the Live Training Environment CRD. HITS supports multiple training exercises. It provides objective data collection of unit performance (in force-on-force, force-on-target, live fire, and associated command post exercises). HITS integrates live training with other simulation environments and enables conduct of training across battlefield functions and collates AAR materials from varied training support/simulations systems for associated training elements. HITS integrates Exercise Planning, System Preparation, Exercise Management, Training Performance Feedback, and System Support to provide a cohesive AAR package. Data sources include, but are not limited to tactical platforms, embedded training systems, tactical engagement simulation training systems, trainer O\C, and external systems. HITS provides capabilities for scenario generation, sensor/simulation/ stimulation interface, and communications backbone capabilities for exercise control and training performance feedback. HITS includes a system of tactical and non-tactical communications and computer software applications and hardware, workstations, databases, voice and video recording-production-presentation equipment, and interface devices.

The HITS Operational Requirements Document (ORD), entitled *Homestation Instrumented Training (HITS) System*, reflects a major change that calls for a two-phase approach. Phase One will provide a company-level training capability. Phase Two will provide a battalion-level training capability, along with more sophisticated simulation and AAR requirements.

Training Strategy

The Combined Arms Training Strategy (CATS) is the Army's overarching strategy for current and future training. It describes how the Army trains and sustains the total force, to standard, in the institution and the unit. HITS supports the CATS by providing a common set of exercise planning, preparation, control, assessment, evaluation, and feedback tools that support unit/collective, self-development, and institutional training pillars found within the CATS. The developmental concept of the Army Transformation Strategy envisions digitization as a critical enabler in reaching the Objective Force. The Objective Force will be internetted and capable of Network Centric Warfare. HITS supports "Network Centric" training with its communications backbone, the fixed tactical internet, that serves as a primary link between the live environments tactical communications and information systems (ABCS/FBCB2) and virtual and constructive training systems (CCTT, BSC, etc.) and live Training Aids, Devices, Simulations, and Simulators (TADSS).

HITS Requirements Analysis

HITS requirements were assessed against current technologies by STRICOM/Applied Research Laboratory of University of Texas (ARL-UT) and submitted to industry for product evaluation. The Commerce Business Daily announcement resulted in 15 submissions by 13 companies. The analysis was designed to identify HITS requirements, identify industry and science/technology organizations that could provide a HITS or HITS components, and assess current products for possible use in meeting HITS requirements.

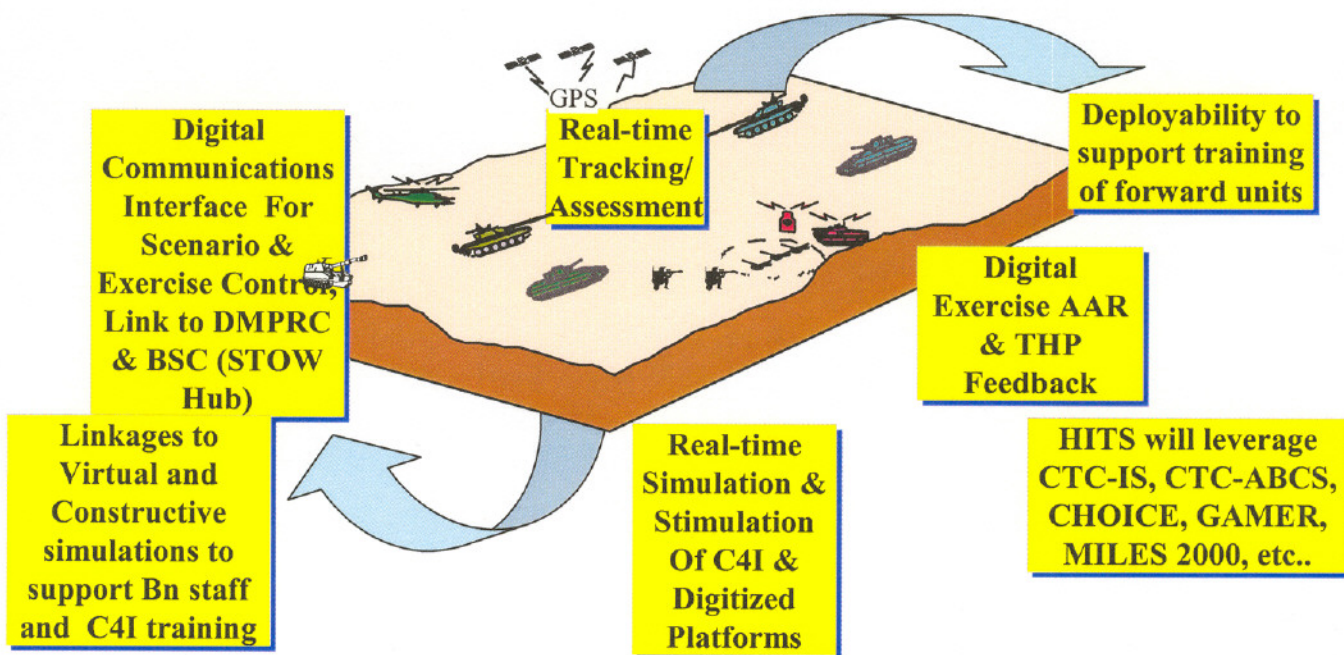
Deployable Instrumentation Support-Europe (DIS-E, formerly known as DITS)

Two (2) vendors joined together and demonstrated a HITS capability in USAREUR in late Aug 01 and under 7ATC guidance continue to develop and refine the capabilities of DIS-E to address the immediate need for a deployable and homestation training capability. DIS-E is an analog training system and the feasibility of transitioning to a digital training capability must be analyzed. Other items of DIS-E that require analysis and review are Life Cycle Contractor Support (LCCS) costs and CTIA compliance. Currently DIS-E is supported and maintained at 7ATC expense due to the system not being Army-standard and/or type classified. §

Homestation Instrumented

Training System (HITS)

HITS provides ability to support combined arms/multi-echelon company team/BN (-) STX/FTX/EXEVAL-- exercise planning, preparation and control; to simulate & stimulate C4I/digital warfighting systems and collect/analyze data for digital AAR/THP



Range Gunnery Signature Simulator (RGSS)

**By Rob Parrish,
Chief Engineer, IT/EL Division, PEO STRI**

The DMPRC at Fort Hood has a requirement for Battlefield Effects. Battlefield/weapon effects such as hostile fire (shoot back) and direct hit (steel-on-steel) are considered "threshold" requirements and must be provided as part of the initial fielding of the Fort Hood DMPRC. Based on schedule and the requirements for Type Classification/Material release, the DMPRC IPT has chosen to modify a Main Gun Signature Simulator (MGSS) developed under the MILES 2000 program. The Range Gunnery Signature Simulator (RGSS) is a modified MGSS that will meet all the "threshold" range requirements for the DMPRC Battlefield Effects Simulator (BES). By modifying the existing "Type Classified/Material Released (TC/MR)" MGSS launcher, the DMPRC RGSS will provide a standard solution for launchers and pyro that will meet both the "force on force" and "force on target" requirements. The RGSS will be able fire both the M30 and M31A1 pyros which have both been fully TC/MR by the U.S. Army. Objective BES requirements for Black Smoke (lethal kill) and Yellow Smoke (NBC) are being pursued and will be compatible with the RGSS launcher.

The RGSS:

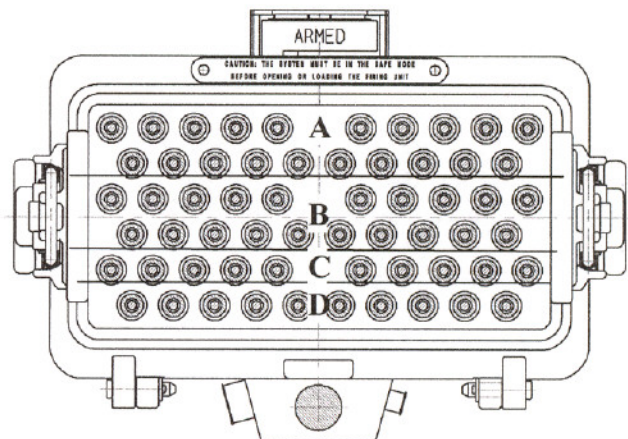
- Leverages Army's TC/MR efforts for MGSS/DIFCUE launcher
- Leverages Army's TC/MR efforts for BES pyro (M30 simulates Main Gun fire – Flash/Bang/Smoke and M31A1 simulates direct fire hit – steel-on-steel/star cluster)
- Leverages "reliable" design of existing launcher and pyros
- Provides 60 shot launcher (3X current range BES devices such as ATKS/GUFS)
- Provides a single launcher partitioned into zones (4) to support multiple weapons and battlefield effects required by live fire/training ranges
- Supports tandem launches for added realism
- Supports "DMPRC/NGATS" recommended RS-485 serial interface. RS-485 bus will provide future flexibility with configuration of zones and cartridge selections.
- Leverages ongoing MGSS/DIFCUE production efforts.
- Utilizes pyros with already established DODICs (M30 – LA06, M31A1 – LA07)

The RGSS is a modified MGSS divided into four (4) zones to support the ranges requirements for battlefield/weapons effects.

MGSS



RGSS



**Zone A - M30 Main Gun Signature/Shoot Back
Zone B - M31A1 "Steel-on steel" effect/Star Cluster
Zone C - Any M31 series / Black Smoke (future)**

DMPRC Team Designs Integrated Desktop

By Mitch Smith
G2 Software Systems, Inc.

The two primary companies developing software for the new DMPRC system, G2 Software Systems Inc. (G2SS) and Riptide Software, are building a seamless desktop providing the user with a common look and feel. To the user of the system, the desktop should look, feel and behave similarly across all Graphic User Interfaces (GUIs) and applications. In today's world, this isn't always easy to do since software developers often work with 3rd party frameworks that differ from one another.

DMPRC uses a 3rd party framework for the development of the 2-dimensional situational awareness window (SAW) called TDF, from Solipsys Corporation. G2SS is customizing the TDF framework to behave as required to support live fire training for DMPRC. This effort consists of developing software under the paradigm established by the TDF framework by customizing the application for the specific needs of the system. The SAW includes G2SS plug-ins for live training ranges, plus the addition of FBCB2 features for creating and injecting FBCB2 messages.

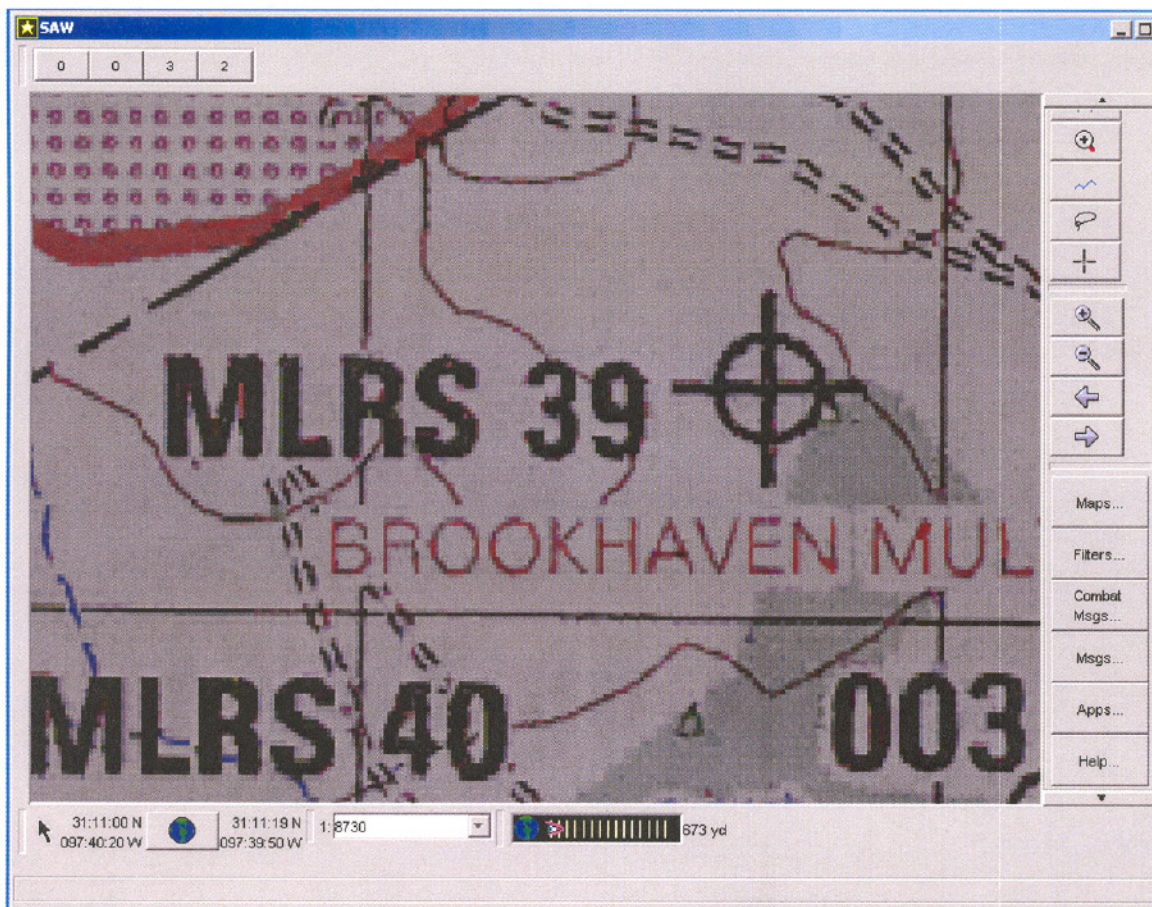


Figure 1 - Saw Customized for FBCB2

Integrated Desktop (Continued from Page 5)

Concurrently, Riptide Software is producing the control and monitoring GUI screens for the DMPC. Riptide has developed a framework based on Java Swing components and a messaging system for communicating between objects within the system. To integrate those GUIs with the SAW and its GUIs, the teams have worked together make it seamless to the user. For starters, the framework uses the “Windows” look and feel, and uses a multiple document interface (MDI) for the DMPC desktop. Events such as a user defining a range asset, for example a battle position (BP), are distributed as messages so that any application which is interested in that message can “listen” for it and process it via event distribution.

Since the SAW application is based on the TDF paradigm, G2SS is developing Java classes that map GUI framework events into TDF events. For instance, when a BP is added via a GUI, the SAW receives message notification and adds that BP to its “track database” for display on the SAW. Likewise, when the user generates an event by clicking on a target icon on the SAW, that event is captured, translated, and sent as a GUI framework event.

Below is a prototype desktop the MDI, GUIs, the SAW, and the minimized windows along the bottom of the desktop.

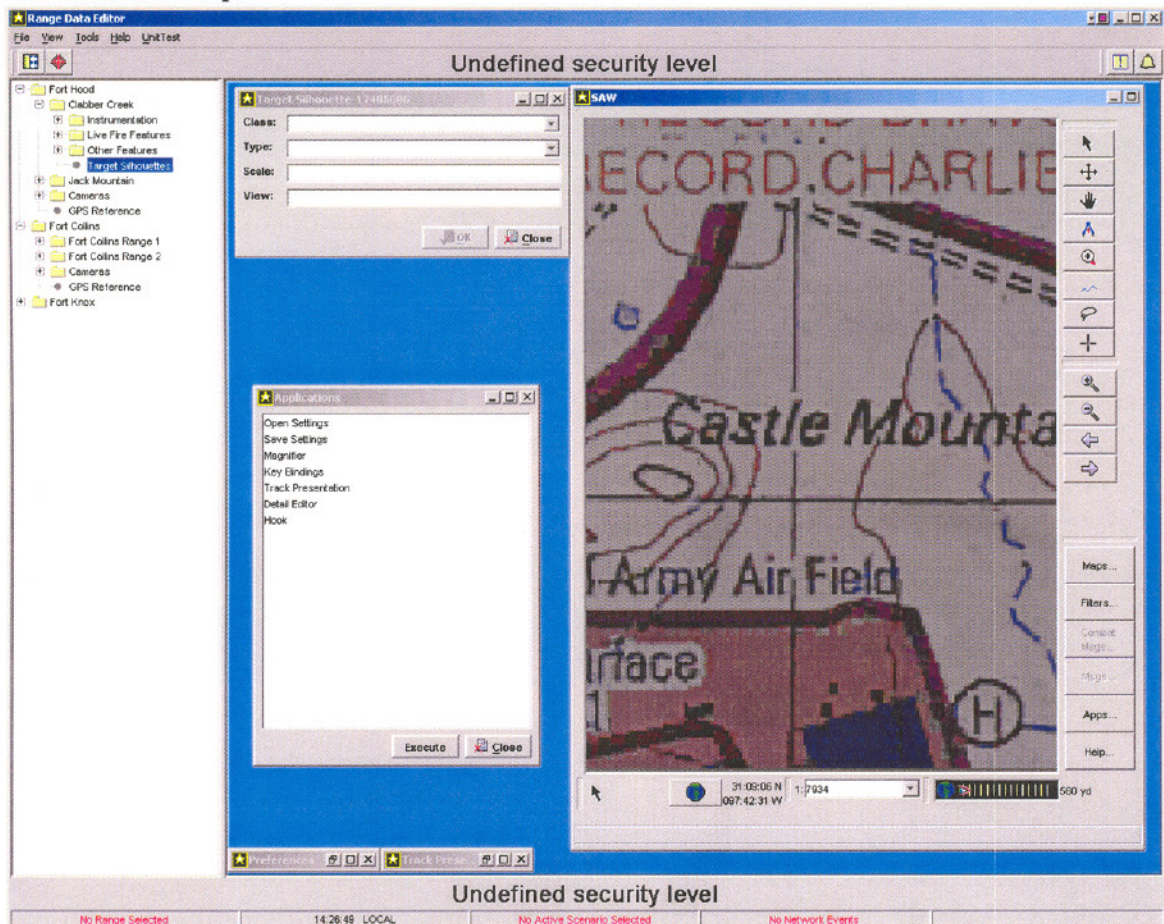


Figure 2 - Desktop Showing Navigation Tree, GUIs, SAW, Minimized Windows

G2SS feels that this integration effort will be beneficial to future types of range and training systems where the graphical displays need to be seamless between other vendor applications and frameworks. §

Common Instrumentation Controllers and Wireless Networks Enhance DMPRC Capabilities, Realism, and Reduce Costs

**By Rob Wolf
ACM Systems, Inc.**

Tapping into state-of-the-art commercial innovations in electronics design and broadband local wireless communications, the DMPRC's Common Instrumentation Controller will complement the robust live fire training range's capability by:

- Enhancing battlefield realism
- Improving fidelity
- Increasing range configuration and reconfiguration flexibility
- Supporting mobile range operations
- Opening the doors of competition; and
- Reducing infrastructure, operation, and support costs

The commonality and reprogrammability of the Common Instrumentation Controller (CIC) and its network of Wireless Node Controllers is a key contributor to achieving these significant benefits. Based on high density Field Programmable Gate Arrays (FPGA), the CIC is able to be reprogrammed to accommodate legacy, existing, and future systems requirements and logic behaviors without the need for board and circuit redesign over the life of the DMPRC. The Wireless Node Network is based on the commercial Bluetooth technology enabling one megabit per/sec throughput rates. Both of these core commercial technologies are being integrated into our commercial marketplace and other military applications.

NSA has adopted the use of FPGAs to host their encryption algorithms enabling them to upgrade cryptograph devices without modifying the hardware and circuitry. Chrysler automotive has adopted the Bluetooth standard to migrate their future cars towards a wireless implementation and expect to save millions annually by increased parts standardization and by reducing the quantity of copper cabling, wire harness, and assembly times for their entire line of automobiles.

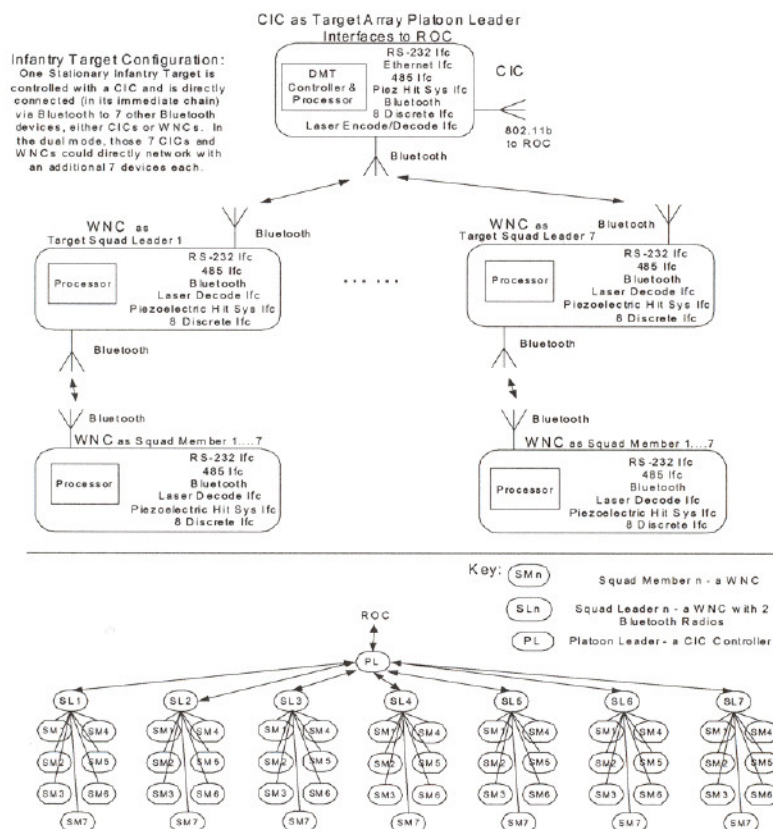
These technologies are being implemented in the DMPRC for the same performance, flexibility, and cost saving reasons. Functionally, the CIC resides at all key target pits and on moving targets interfacing with and controlling all target related assets. The fully reprogrammable and multi-interface CIC interfaces with any vendor's lifters, moving sleds, thermal blankets, battlefield effect pyrotechnics, acoustic sensors, and any other legacy or future target pit instrumentation asset providing command and status functions. Range operators will have full situational awareness of the health and status of all range instrumentation assets at their fingertips.

The DMPRC has several implementations incorporating these technologies. Each implementation uses the same common components to achieve a diverse set of mission enhancing realism effects.

Common Instrumentation Controllers (Continued from Page 7)

The first application involves the CIC and Wireless Node Controllers (WNC) managing a vast array of infantry targets and their associated sensors in support of either fixed site or mobile range operations. The CIC provides a robust processing capability, FPGA based logic and behavior reprogrammability, wireless Ethernet communications to the ROC via 802.11b or fiber optics, and numerous other performance features. Supplementing the CIC in this scenario is an extensive network of inexpensive WNCs. Both the CIC and the WNC are capable of extreme flexibility in interfacing to and controlling existing and future target pit devices. Interfaces include Ethernet, RS-232, RS-485, and up to 8 discrete inputs. The automated remote wireless networking scheme that can manage numerous clusters of remote target pits further expands the range configuration flexibility in providing new and different views to the gunnery crew, and in reducing range configuration set up times. Each dual mode CIC and WNC can interface with and manage seven other WNC devices in seven other target pits within a hundred feet or so of each device creating a tiered scatter net communications array.

This architecture enables significant flexibility in configuring, reconfiguring and improving the DMPRC's ability to present new effects to the live fire training crews and dismounted soldiers. The following diagram illustrates the CIC and WNC array applied to managing and controlling infantry targets.



This infantry target network can be expanded even further by connecting additional WNCs to each of the lower link Squad Members.

The second broad application of the WNC involves interfacing various battlefield sensors and effects devices to the M1 and M2 weapon systems to create a roaming wireless network to enhance battlefield effects realism and improve the level of AAR training feedback.

In one scenario the WNC is interfaced to numerous Battlefield Effects Simulators (BES) pyrotechnical devices distributed about the battlefield and along the training lanes. As the Gunnery crews move up the lanes, the Bluetooth wireless local network on the vehicles search for the BFE WNCs to establish a communications link within the sphere of their personal umbrella. This process of establishing and dropping multiple communications links with the various BFE WNC devices continues as the vehicles progress along the gunnery range.

Now for the good part, when an artillery mission is executed at the ROC, a broadcast message is sent to all the vehicles and dismounted soldiers identifying the type, time and coordinates of the artillery mission. Each soldier and vehicle player unit instrumentation determines if they are in the zone affected by the mission. If they are, and they have a communications link with a BES WNC in their vicinity, then a command is sent from the player unit electronics, via the soldier/vehicle Bluetooth radio to the BES WNC device, commanding it to fire off a simulated artillery round(s).

This dynamic distributed BES simulation enhances realism and saves rounds by only firing those devices that are in the proximity of the effected crew and enable the Range Operations team to move and place the BES devices to create the best realism possible.

Another WNC implementation scenario involves positioning sensors in the gunnery firing positions to determine the vehicles exact level of exposure and relative hull down position. In this application the WNC interfaces to firing position optical sensors. As the sensors are tripped, messages are sent to the vehicles Bluetooth and in turn relayed to the ROC via the player unit 802.11b radio, enabling accurate knowledge of the various levels of exposure to enemy fire.

The Common Instrumentation Controller and the Wireless Node Controllers' applications are nearly unlimited in the number and types of dynamic scenarios that can be implemented on the range. As new range mission enhancing tools are conceived and fielded the flexibility of the CIC and WNC will be able to integrate those capabilities into existing and future DMPRC range environments.

Another high dividend implementation of this wireless area network is in providing full situational awareness to ROC operators for safety, realism, and enhanced AARs for the exercise training participants. When soldiers enter a vehicle the Bluetooth wireless network inside, the vehicle associates those individual soldiers with that specific vehicle. The vehicle player unit recognizes which soldiers are in the vehicle and relays the soldier's identification to the ROC as well as relaying ROC administrative commands and updates to those soldiers in the vehicle. If the vehicle is catastrophically killed, so to are the soldiers inside that vehicle. Soldiers outside the vehicle seeking cover from small arms fire could also be assessed injuries because of their proximity to the vehicle if it were to be hit by an anti-tank round.

The features and functionalities discussed in this article also apply to mobile and fixed site MOUT operations within and around buildings.

Initially, the dynamically controlled indirect fire simulation capability and levels of hull defilade and exposure capability will be integrated in the first DMPRC at Fort Hood along with very limited numbers of the CICs controlling target pit assets due to budgetary reasons. Subsequent DMPRC ranges will be fully instrumented as described in this article along with a retrofit at Fort Hood in order to ensure an open architecture enabling interfacing to legacy and future vendor target pit devices and sensors.

The DMPRC is incorporating state-of-the-art technology at many levels to enhance battlefield realism, improve safety, reduce operation and sustainment costs, and most importantly, provide the best possible live gunnery range training experience with constructive and effective AAR feedback to the soldier. §

Battle Area Complex (BAX)

Contributed by

**Range and Targets Team, Live Training Division,
Army Training Modernization Directorate (ATMD).
Army Training Support Center (ATSC), Fort Eustis, VA**

The Battle Area Complex (BAX) is a new live fire range designed specifically to support the new Stryker Brigade Combat Team (SBCT). The organic SBCT organization is Infantry-centric but will include an anti-armor and breaching capability with the direct fire 105mm armed Mobile Gun System (MGS) on the Stryker platform. (Note: The SBCT Infantry units possess the “fire and forget” Javelin anti-armor missile system.)

The BAX was originally designed with stationary Infantry targets (SITs), moving Infantry targets (MITs), stationary armor targets (SATs), moving armor targets (MATs), contaminated area, breach area, and supplementary structures/facilities as required (i.e., urban combat). Target numbers and layout are based on the current qualification standards (or draft for the MGS) of the weapons systems in the SBCT. Typical live fire scenario supported by this BAX range is Infantry dismounting from their Stryker vehicles, assaulting an objective while supported by MGS main gun fire. The BAX is intended to support Platoon/Company level combined arms live fire exercises (LFXs). The supplementary structures/infrastructure can provide the Infantry and MGS with an urban objective at some point within the footprint of the BAX. Army Training Support Center (ATSC) and Infantry School representatives met 7-8 January 2003 to continue refining the BAX design.

The BAX is a flexible range design: Intended to be fully Common Training Instrumentation Architecture (CTIA) compliant, capable of stimulating digitized systems if the proper instrumentation is installed, incorporate Next Generation Army Targetry System (NGATS) when available, and operate in conjunction with other/adjacent ranges in the range complex.

The BAX is intended to support the 96 hour SBCT deployment sequence, by providing the Commander with the capability to train all collective live fire METL tasks at Home Station. Train, Alert, Deploy. It is funded and in the Army Master Range Plan (AMRP). First BAX will support the 2d Cavalry at Fort Polk, LA.



ABCS Considerations for Digital Ranges

By Joe Brennan

The Digital Range Multi-purpose Range Complex (DMPRC) will be the first in a series of digital range training applications. The DMPRC capability will initially focus on Lower Tactical Internet (LTI) interoperability as indicated in Figure 1 below. The components of the LTI include the Force XXI Battle Command Brigade and Below (FBCB2) system, the Internet Controller (INC), the Single Channel Air to Ground Radio System (SINGARS), the Enhanced Position Location Reporting System (EPLRS).

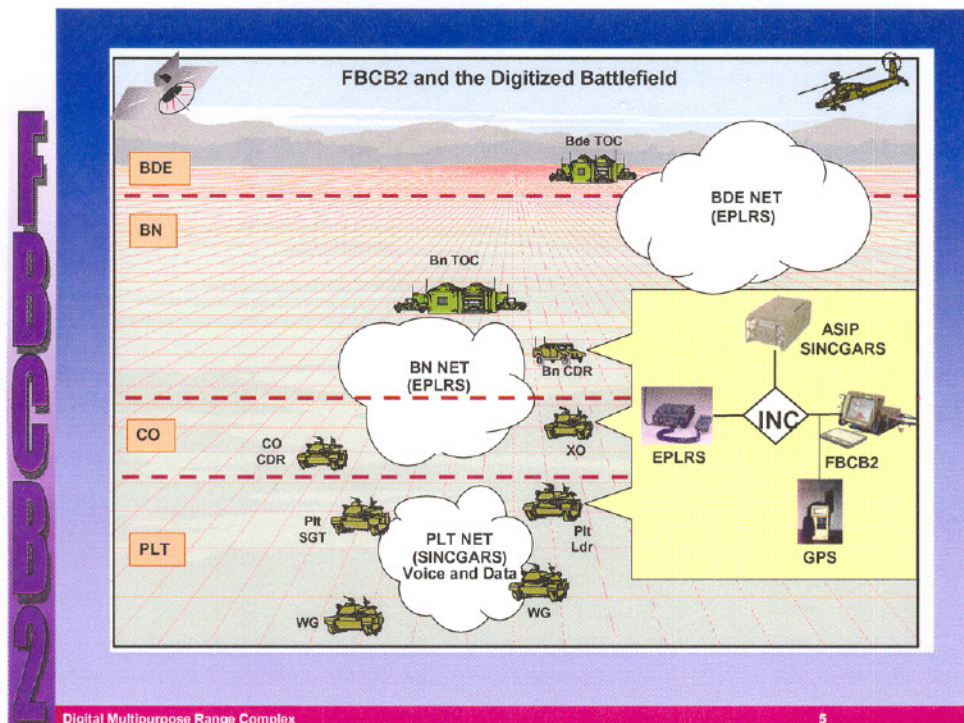


Figure 1: FBCB2 and the Digitized Battlefield (for DMPRC)

Digital Ranges will be expanded beyond the initial capability provided by DMPRC to support both Lower and Upper Tactical Internet (UTI) interoperability with Army Battle Command System (ABCS) components (in addition to FBCB2). The focus of this section of this newsletter will be on ABCS considerations as a whole.

Significant ABCS-related considerations for Digital Ranges applications presently exist. One aspect of these considerations include training systems capabilities tradeoffs. Significant capabilities tradeoffs exist between training systems fidelity, training benefit, and overall program cost/schedule. For example, it is not cost-effective for training systems to develop, field, and support components which identically emulate/replicate ABCS systems/networks, although this might be considered ideal from the training perspective if cost and schedule were not factors, and technology guaranteed performance would not be an issue.

Other ABCS considerations for digital ranges include working to resolve some of the issues that limit the ability to support ABCS related training needs. Many of these issues results from the fact that ABCS systems are primarily designed to provide an “operational mode” of operation and not a “training mode” of operation. “Training mode” of operation for ABCS systems would ideally:

- provide capabilities to support mission planning, battlefield visualization, “replay” of scenarios/vignettes, after action reviews, and classroom seminars.
- provide “fictitious” addresses which would enable fictitious user groups to be created and data to be sent and received for digital training range exercises.
- provide ABCS systems with the capability to “toggle” between “training mode” (for training purposes) and “operational mode” (for real world operations) without the need for spending several hours to purge and reinitialize the ABCS systems databases. Deployed units on real world missions require the capability to train and immediately “switch” to real-world data when required. Providing a “training mode” of operation would ensure that soldiers can participate in challenging and realistic training using their actual ABCS equipment while maintaining the ability to readily activate the “go to war” configuration in the event of actual emergencies.

One way to resolve the above “training mode of operation” issue might be to provide training bricks as part of the Army’s inventory, while maintaining “go to war” bricks as separate items (i.e., each ABCS system would have two sets of bricks -- 1 set for training operations and 1 separate set for “go to war” operations). The training bricks might then be able to be enhanced to provide improved training capabilities to include:

- Increased terrain correlation & data synchronization between training systems & ABCS systems
- Time synchronization to allow soldiers to “fight” at any time of the day and on any given date using their ABCS systems
- Checkpoint restart and faster than real time in support of seminar mode, after action review (AAR), and reinforcement training using ABCS systems
- Improved embedded training applications for ABCS systems
- Improved mission planning/rehearsal and battlefield visualization applications for ABCS systems
- Remote time management such as “start”, “stop”, and “pause”
- “Fictitious” addresses which would enable fictitious user groups to be created and data to be sent and received
- Automatic task organization synchronization as units enter digital ranges§